The cornerstone of natural resource stewardship: Vital signs monitoring

by Steve Fancy

IN 2002, AS A MAJOR COMPONENT OF THE NATURAL Resource Challenge, 12 "vital signs" monitoring networks encompassing 101 parks made considerable progress with the difficult task of developing an integrated natural resource monitoring program. Another 5 networks (for 52 parks) received planning funds. Together, these 17 networks are designing a system for natural resource data collection, analysis, and reporting that is unprecedented in the history of the National Park Service.

Natural resource monitoring identifies and tracks "the most significant indicators of ecological condition and the greatest concerns of each park," known as vital signs, to provide park managers with the broad-based, scientifically sound information they need to effectively manage park resources. Monitoring focuses on the natural resources that park managers are directed to preserve "unimpaired for future generations," including water, air, geologic resources, plants and animals, and the various ecological, biological, and physical processes that created the parks and continue to act upon them.

Why is the vital signs monitoring program so important to the protection of natural resources for future generations? Simply put, monitoring provides a basis for understanding and identifying meaningful change in natural systems characterized by complexity, variability, and surprises. Knowledge and understanding result in better management decisions and allow park managers to work more successfully with the public and other agencies to protect park resources. Additionally, the credible scientific information that results from monitoring can help to resolve contentious and difficult resource issues. For example, the challenge of sustaining a natural system is even more complicated when natural areas have been so highly altered that physical and biological processes no longer operate (e.g., control of fires and floods in developed areas). In these situations, monitoring can help managers understand how to develop the most effective approach to restoration.

"Vital signs monitoring is an ongoing effort with many partners to better understand how to sustain and restore park natural systems … before irreversible loss can occur."

Hawksbill turtles at Buck Island Reef National Monument in the Caribbean Sea have benefited from the efficient and cost-effective methods developed by the Virgin Islands/South Florida prototype network for monitoring and restoring sea turtle populations. In 2002, an interagency team of scientists reviewed the network's program and commended the park staff on their success.

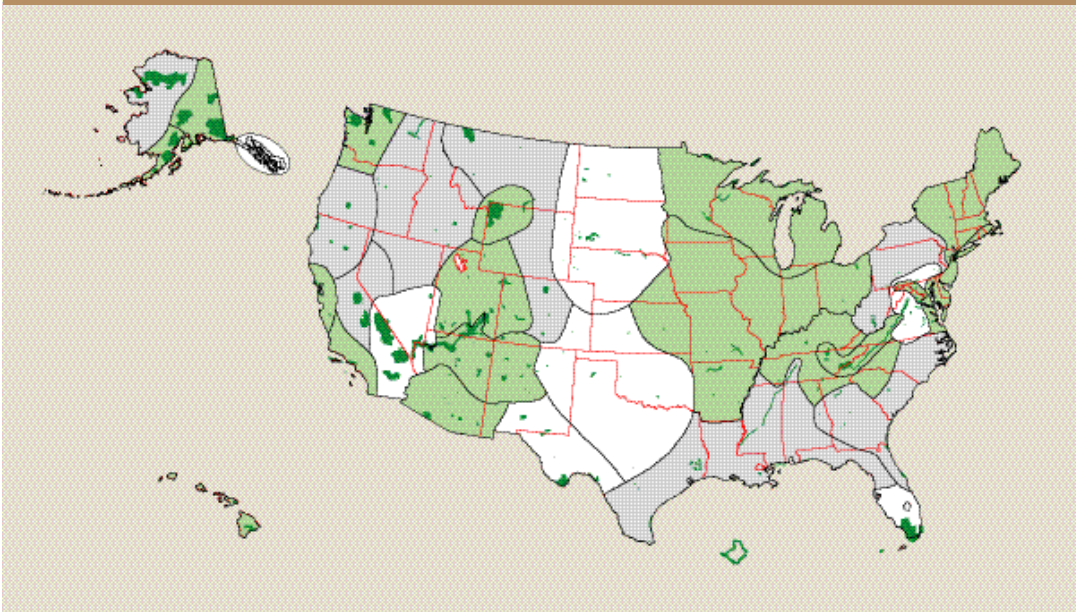
And why is the task of developing an integrated, multipark, and interagency monitoring program so challenging? Our understanding of ecological systems and the concepts of sustainability and integrity of natural systems has evolved: the classic view of the "balance of nature" has been replaced by a nonequilibrium paradigm. The new model recognizes that ecological systems are regularly subject to natural disturbances—such as droughts, floods, and fires—that alter the composition and structure of these systems and the processes that shape them. In addition, no single spatial or temporal scale is appropriate for all of the ecosystem components and processes. Depending on the resource, the appropriate scale for its understanding and effective management might be at the population, species, community, or landscape level. Not only are natural systems complex and ever changing, but parks are open systems. For example, threats such as invasive species and air and water pollution come from outside park boundaries. The scope and scale of many other threats and solutions also extend beyond park boundaries, requiring a multiagency, ecosystem approach to understand and manage these natural systems.

The overall strategy for implementing long-term ecological monitoring in approximately 270 parks with significant natural resources involves two components: 11 experimental or "prototype" monitoring programs begun in 1992, and 32 vital signs monitoring networks of parks linked by

Legend

- Monitoring networks funded in FY 2001–2003 for core park vital signs and water quality monitoring
- Monitoring neworks proposed for funding in FY 2004 for core park vital signs and water quality monitoring
- Monitoring networks that will not be funded as of FY 2005

PARK VITAL SIGNS MONITORING NETWORKS



NPS MAP BY NATURAL RESOURCE INFORMATION DIVISION

geography and shared natural resource characteristics. Parks within each of the 32 networks will work together and share funding and professional staff to plan, design, and implement an integrated, long-term monitoring program. Currently, 17 of the 32 monitoring networks are under way, and the remaining 15 networks await funding to make this important management tool available to the entire National Park System.

The complicated task of developing a network monitoring program requires an initial investment in planning and design to guarantee that monitoring meets the most critical information needs of each park and produces scientifically credible data that are readily accessible to managers and researchers. These front-end investments also ensure that monitoring will build upon existing information and understanding of park ecosystems and make maximum use of leveraging and partnerships with other agencies and academia.

At the end of FY 2002, the first 12 networks had completed Phase 1 of the three-phase planning and design process. The Phase 1 report developed by each network includes the results of summarizing existing data; defining goals and objectives; beginning the process of identifying, evaluating, and synthesizing existing data; developing draft conceptual models; and completing other background work that must be done before the initial selection of vital signs. The Phase 1 reports are peer reviewed and approved at the regional level before the network proceeds to the next phase. Phase 2 involves a series of meetings and scoping workshops to prioritize and select the indicators that will be included in the network's initial integrated monitoring program. Phase 3 entails the detailed design work needed to implement monitoring, including the development of sampling protocols, a statistical sampling design, a plan for data management and analysis, and details on the type and contents of various products of the monitoring effort, such as reports and websites.

During the past two years, park networks involved in the planning and design of monitoring programs have received assistance from numerous federal and state agencies, nongovernmental organizations such as NatureServe, private contractors, Cooperative Ecosystem Studies Units, and academic scientists from more than 100 universities. The efforts of these entities to develop an integrated, systems-based monitoring program have catalyzed the development of a number of interagency partnerships. Today, vital signs monitoring is an ongoing effort with many partners to better understand how to sustain and restore park natural systems, and it serves as an early-warning system to detect declines in ecosystem integrity and species viability before irreversible loss can occur. The vital signs monitoring networks are a central component of natural resource stewardship as the National Park Service embraces the concepts of "parks for science" and "science for parks." ■

steven_fancy@nps.gov
National Monitoring Coordinator, Inventory and Monitoring Branch; Natural Resource Information Division, Fort Collins, Colorado